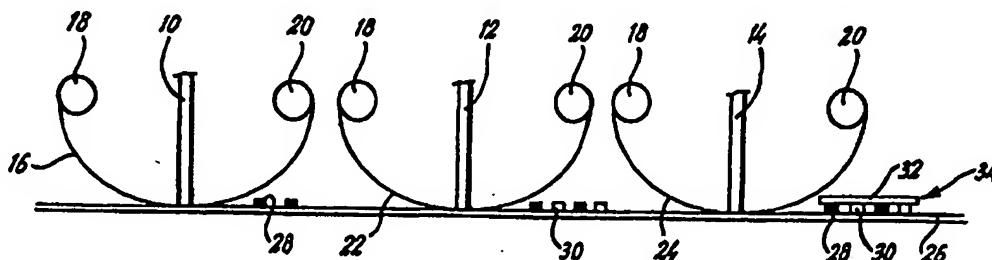


PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B44C 1/17, 1/175, C04B 41/45, B41M 3/12	A1	(11) International Publication Number: WO 97/00781 (43) International Publication Date: 9 January 1997 (09.01.97)
(21) International Application Number: PCT/GB96/01487 (22) International Filing Date: 19 June 1996 (19.06.96) (30) Priority Data: 9512530.8 20 June 1995 (20.06.95) GB (71)(72) Applicants and Inventors: ASHLEY, Michael, David [GB/GB]; Links, Liss Business Centre, Liss, Hampshire GU33 7AW (GB). RAWLINGSON, Robert, John [GB/GB]; Links, Liss Business Centre, Liss, Hampshire GU33 7AW (GB). (74) Agent: SALES, Robert, Reginald; Swindell & Pearson, 48 Friar Gate, Derby DE1 1GY (GB).	(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	

(54) Title: METHOD OF MAKING A DECAL**(57) Abstract**

The method comprises printing a decoration onto a substrate using a thermal transfer printer. It is particularly but not exclusively suited to the decoration of ceramic articles. In one embodiment the method may comprise passing a band of backing paper (26) through a thermal transfer printer which has a plurality of heads (10, 12, 14) arranged sequentially. The heads print a pattern (28, 30) of ceramic inks onto the backing paper. A covercoat (32) may then be printed over the ceramic inks.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

Method of making a decal.

This invention concerns a method of making a decal, and particularly but not exclusively a decal for decorating a ceramic article; and also a decal made by such a method.

Decals are used for a variety of purposes. A common use of decals is for the decoration of ceramic articles. Such decals may be of the waterslide type where the decorative image is provided on a backing paper and is adhered thereto by a water soluble adhesive. The decal is generally placed into water prior to application such that the backing paper can be slid from the rest of the decal with some of the soluble adhesive remaining on the decal to provide adhesion onto an article.

Another type of decal is a heat release decal. In such a decal a heat actuable adhesive binds the decorative layer of the decal onto a backing paper and a further heat actuable adhesive is provided on the opposite side of the decorative layer. During application this further adhesive layer is heated to enable the decal to be mounted onto an article. The other adhesive layer is then actuated to permit the backing paper to be removed.

Decals for ceramic articles like other decals, are

- 2 -

generally provided with a covercoat in the form of a transparent layer which enables transportation and placement of the decal. Such decals are usually subsequently fired with the colours in the decorative layers being provided in most instances by pigments. The covercoat generally burns off during firing. Such decals are usually produced by traditional printing methods which require artwork to be filmed, the preparation of printing plates or silk screen plates and the setting up of presses by skilled people before a decal is produced. Other more flexible printing methods such as ink jet printing have been tried but difficulties are often encountered in using conventional inks for ceramics with such printing methods.

A thermal transfer printer is a machine presently used mainly in the production of rolls of labels. Such a printer creates an image by melting ink from a film ribbon and transferring it at selective locations onto a receiving material. Such a printer usually comprises a print head including a plurality of heating elements which may be arranged in a line. The heating elements can be operated selectively. A thermal ribbon comprising a relatively thin film with an ink coating on one side is located against the print head with the ink on the opposite side of the film to the print head. A substrate is made to pass beneath and substantially in

- 3 -

contact with the film, such that selective heating of the print head causes ink on the film adjacent the actuated printing elements to be transferred to the substrate. The ink on the film is usually resin or wax based and a release agent may be provided between the ink and the film.

According to the present invention there is provided a method of making a decal, the method comprising printing a decoration onto a substrate using a thermal transfer printer.

The method preferably comprises printing a plurality of colours to form the decoration, and a separate print head is preferably provided for each colour. The print heads may be arranged such that the substrate passes the print heads sequentially.

Alternatively, the substrate may make a number of passes past one or more print heads.

A covercoat may be provided on the decal, and the covercoat is preferably printed by a thermal transfer printer, desirably with a separate print head for printing the covercoat. The covercoat is preferably printed only so as to cover the parts of the substrate upon which the decoration is provided.

Alternatively, the decoration may be printed onto a film, which film acts as a covercoat.

A carrier layer may be provided on the substrate prior to or subsequent to printing of the decoration, and the carrier layer is preferably printed by a thermal transfer printer. The decoration preferably comprises inks may be formed of coloured pigments, and which preferably include a heat actuatable resin or wax.

The substrate may comprise transfer backing paper.

The decal may be of the waterslide type, and a water soluble adhesive may be provided on the backing paper.

Alternatively, the decal may be of the heat release type, and a first heat actuatable adhesive may be provided on the backing paper, and a second heat actuatable adhesive printed after the decoration, desirably by a thermal transfer printer.

The printer heads are preferably computer controlled. A plurality of decals may be printed sequentially onto a band of backing paper which is caused to move past the or each print head. A cutter may be provided to separate the printed decals from each

- 5 -

other.

A registration mark may be printed on the substrate to ensure identical registration of the or each print head to the substrate.

The invention also provides a method of making a ceramic decal according to any of the preceding eleven paragraphs.

The invention still further provides a decal made by a method according to any of the preceding twelve paragraphs.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawing which is a diagrammatic side view showing a decal being made by a method according to the present invention.

The drawing shows a waterslide transfer according to the present invention being made. Three thermal transfer printer heads 10, 12, 14 are provided in line. The first head 10 is provided with a ribbon 16 of a first colour ceramic ink which extends from a first supply roller 18 to a take-up roller 20. The ribbon 16 comprises a thin film locatable adjacent the printer

- 6 -

head 10. On the film, on the opposite side thereof to the head 10, is provided a release layer upon which is provided a pigmented ink which includes a heat actuable wax.

The printer head 12 has a similar ribbon 22 again provided with a supply roller 18 and take-up roller 20. The ribbon 22 however is provided with a different colour pigmented ink. The head 14 is again similar, and is provided with a ribbon 24 extending between rollers 18 and 20. The ribbon 24 has mounted on it a material suitable for forming a covercoat for a ceramic decal. Each of the printer heads 10, 12, 14 comprises a plurality of selectively operable heating elements arranged in a line extending normally to the plane of the drawing.

Extending beneath the heads 10, 12, 14 so as to be substantially in contact with the respective ribbons 16, 22, 24 immediately beneath the heads 10, 12, 14, is a band 26 of ceramic decal backing paper. The band 26 comprises a paper with a layer of a water soluble adhesive such as dextrin provided thereon. The band 26 extends from a roll of paper (not shown) located to the left hand side relative to the drawing. The apparatus shown in the drawing is computer controlled.

- 7 -

In use, a decorative image required on a waterslide decal is entered or stored in the computer. The band of paper 26 is caused to move to the right as shown in the drawing. As the band 26 moves the heating elements in the respective heads 10, 12, 14 are selectively actuated so as to print a respective pattern of the ink or covercoat material located thereon, onto the band 26. The drawing shows the head 10 printing a first colour 28, with the head 12 printing a second colour 30 and the head 14 printing a covercoat 32 over the first and second colours 28, 30. The apparatus therefore produces a decal 34 which can be applied onto a ceramic article by conventional waterslide techniques for subsequent firing. Each decal 34 can obviously be cut from the band 26 as required.

There is thus described a method of producing a ceramic decal which provides for a considerable number of advantages relative to conventional techniques. This printing process is totally dry and trained operators are not required to operate the printers. No printing plates/printing screens are required to be made and this method is therefore economical with small runs. As the printing process is computer controlled, each decoration may be different and the artwork can be electronically stored. As the covercoat is printed using the transfer printer, this need only be printed directly over where

the decoration is provided.

Various modifications may be made without departing from the scope of the invention. For instance, the described example only discloses a two colour system and many further colours can obviously be printed to form a more complex decoration. A greater number of printer heads may be provided and/or different colours may be provided in subsequent runs beneath the same printer heads. Registration of the backing paper relative to the printer heads may be by virtue of electronic synchronisation or a registration mark could be printed on the substrate. A synchronised cutter may be provided downstream of the printer heads to separate the individual decals.

As an alternative to printing onto a backing paper, the decorative layer could be printed in reverse onto a film. This film could act as a covercoat being burnt off during firing, but allowing handling of the decal prior to application.

This method can be used to print other types of decals other than that described above. For instance, a carrier layer may be provided beneath or above the decorative layer. The method could be used to print heat release decals, and the heat actuable adhesive may

- 9 -

be printed using the transfer printer or by a different technique. The method may be used to print decals other than for use on ceramic articles. Spot colour where each colour is a separate image can be used as well as process colour where an image is split into its component parts.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims:-

1. A method of making a decal, characterised in that the method comprises printing a decoration onto a substrate using a thermal transfer printer.
2. A method according to claim 1, characterised in that the method comprises printing a plurality of colours to form the decoration.
3. A method according to claim 2, characterised in that a separate print head is provided for each colour.
4. A method according to claim 3, characterised in that the print heads are arranged such that the substrate passes the print heads sequentially.
5. A method according to claim 2, characterised in that the substrate makes a number of passes past one or more print heads.
6. A method according to any of claims 1 to 5, characterised in that the decal is of the waterslide type.
7. A method according to any of claims 1 to 5, characterised in that the decal is of the heat release type.
8. A method according to any of claims 1 to 7, characterised in that a covercoat is provided on the decal.
9. A method according to claim 8, characterised in that the covercoat is printed by a thermal transfer printer.
10. A method according to claim 9, characterised in that a separate print head is provided for printing the covercoat.
11. A method according to claims 9 or 10, characterised in that the covercoat

is printed only so as to cover the parts of the substrate upon which the decoration is provided.

12. A method according to any of claims 1 to 11, characterised in that a carrier layer is provided on the substrate prior to or subsequent to printing of the decoration.

13. A method according to claim 12, characterised in that the carrier layer is printed by a thermal transfer printer.

14. A method according to any of the preceding claims, characterised in that the substrate comprises transfer backing paper.

15. A method according to claim 14, characterised in that a plurality of decals are printed sequentially onto a band of backing paper which is caused to move past the or each print head.

16. A method according to claims 14 or 15 when dependent on at least claim 6, characterised in that a water soluble adhesive is provided on the backing paper.

17. A method according to claims 14 or 15 when dependent on at least claim 7, characterised in that a first heat actuable adhesive is provided on the backing paper, and a second heat actuable adhesive is printed after the decoration.

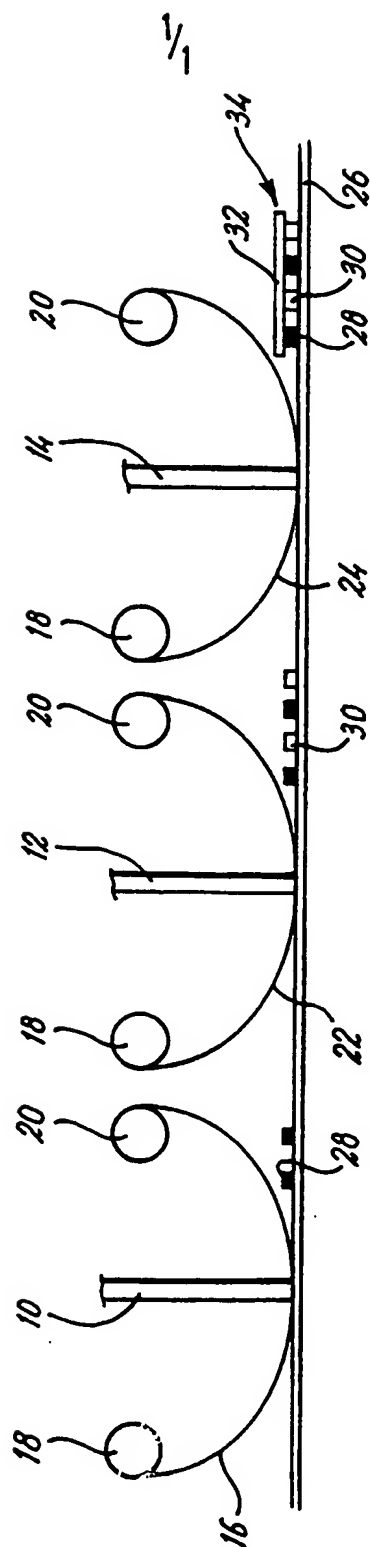
18. A method according to claim 17, characterised in that the second heat actuable adhesive is printed by a thermal transfer printer.

19. A method according to any of claims 1 to 7, characterised in that the decoration may be printed onto a film, which film acts as a covercoat.

20. A method according to any of the preceding claims, characterised in that

the decoration comprises inks formed of coloured pigments.

21. A method according to claim 20, characterised in that the inks include a heat actuatable resin or wax.
22. A method according to any of the preceding claims, characterised in that the printer heads are computer controlled.
23. A method according to any of the preceding claims, characterised in that a cutter is provided to separate the printed decals from each other.
24. A method according to any of the preceding claims, characterised in that a registration mark is printed on the substrate to ensure identical registration of the or each print head to the substrate.
25. A method of making a ceramic decal characterised in that the method is according to any of the preceding claims.
26. A decal characterised in that the decal is made by a method according to any of the preceding claims.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 96/01487

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B44C1/17 B44C1/175 C04B41/45 B41M3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B44C C04B B41M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,2 697 466 (FORMES ET DECORS CERAMIQUES) 6 May 1994 see page 1, line 1 - page 7, line 4 ---	1-7, 14-16, 20-22, 25,26
X	CA,A,1 335 329 (D. C. BERGHAUSER ET AL) 25 April 1995 see page 1, paragraph 2 - page 4, paragraph 2 ---	1,2,14, 20-22, 25,26
Y	---	3-5,12, 24
Y	US,A,4 731 091 (OSAMU MAJIMA) 15 March 1988 see column 3, line 1 - column 6, line 40 ---	3-5,12, 24
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

10 September 1996

Date of mailing of the international search report

17. 09. 96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Doolan, G

INTERNATIONAL SEARCH REPORT

Int. Application No

PCT/GB 96/01487

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 322 467 (K. P. HEIMBACH ET AL) 30 March 1982 see column 3, line 20 - column 9, line 58 ---	1-4,6,7, 12-16, 19-21, 23-26
A	DE,A,36 38 170 (W. MAURER) 11 May 1988 see column 2, line 18 - column 6, line 23 -----	1-3,5-8, 14, 20-22, 25,26

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 96/01487

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-2697466	06-05-94	NONE	
CA-A-1335329	25-04-95	CA-A- 1338373	11-06-96
US-A-4731091	15-03-88	AU-B- 550628	27-03-86
		AU-A- 8640782	03-02-83
		CA-A- 1188512	11-06-85
		DE-A- 3227831	24-02-83
		FR-A- 2510042	28-01-83
		GB-A,B 2106148	07-04-83
		NL-A- 8202999	16-02-83
		US-A- 4505975	19-03-85
US-A-4322467	30-03-82	US-A- 4292104	29-09-81
DE-A-3638170	11-05-88	NONE	